REMARKS

Claims 1-11 remain in this application. Claims 1 and 2 have been amended and claims 3-11 have been submitted for consideration. No new matter is believed to be introduced by these amendments of the claims. (See, inter alia, page 4, line 25- page 6, line 20.)

Reconsideration and allowance in view of the foregoing amendments and the following remarks are respectfully requested.

In the Official Action dated April 25, 2002, claim 1 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Dunfield et al., U.S. Patent No. 5,694,268 (hereinafter DUNFIELD) in view of Aimiya, U.S. Patent No. 5,416,655 (hereinafter AIMIYA), Sakuragi et al., U.S. Patent No. 5,598,047 (hereinafter SAKURAGI) and Takemura et al., U.S. Patent No. 5,880,545 (hereinafter TAKEMURA). This rejection is respectfully traversed.

Claim 1 has been amended to define a structural feature of the invention and to more clearly distinguish over the applied prior art references. In particular, the cited cylindrical hub and the cited fixed shaft are defined more clearly.

It is an object of the present invention to provide an ultra-slim structure of disk-spindle motor by removing an upper end portion of the hub of the spindle motor.

To achieve the above-noted object, the spindle motor of the present invention, as recited in amended claim 1, includes, inter alia, a base plate having a circular hole at a central portion thereof, a housing fixedly positioned in the circular hole of the base plate, a fixed shaft formed unitarily with the housing at a central portion of the housing and extending inwardly into the housing, a stator bonded to an upper end portion of an inner circumferential face of the circular hole, a lower ball bearing bonded to a lower side of an outer circumferential face of the fixed shaft, an upper ball bearing spaced by a certain interval from the lower ball bearing and bonded to an upper side of the outer circumferential face of the fixed shaft.

The spindle motor further comprises a cylindrical hub both ends of which are open, the cylindrical hub having an inner protruding portion protruding from a central portion of an inner circumferential face of the hub and an outer protruding portion protruding from an upper side of the outer circumferential face of the hub, the inner protruding portion being fixedly provided between the lower ball bearing and the upper ball bearing. A permanent magnet is bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub, a disk is mounted on an upper face of the outer protruding portion of the hub, and a clamp is fixed to the upper side of the hub by a bolt to mount the disk to the hub. The cylindrical hub is configured to provide a gap between the shaft and the clamp.

The references cited to support the rejection do not disclose such a combination of features. The primary reference DUNFIELD refers to and is concerned specifically with a spindle motor which applies an overmold to a stator in order to smooth a surface of the stator 156 and to reduce an acoustic noise. Also, DUNFIELD places the sealing regions over one bearing 160 and under the other bearing 162 to prevent debris from entering into the bearings 160 and 162.

In contrast, in the present invention, the cylindrical hub 250 is open-ended on both upper and lower sides and the clamp 280 is fixed on the hub. Thus, the clamp 280 performs both sealing and fixing of the disk at the same time, thereby allows the present invention to provide an ultra-slim spindle motor which prevents an increase in thickness caused by the sealing region. (See Figures 2a and 2b.) Therefore the present invention provides an advantage in that the spindle motor can be mounted on a small size personal digital assistant (PDA), a digital camera, and so on because the upper end portion of the hub of the spindle motor is eliminated in the ultra-slim spindle motor of the present invention (see page 7, lines 3-7).

The secondary reference AIMIYA is directed to a spindle motor which can use a space around an inside of the cover 6 effectively. AIMIYA places a hub 15 over a bearing to prevent debris from entering into the bearings 12 and 13. A stator unit 18, a pole 17 and yoke 19 are located over the hub. Thus AIMIYA is not concerned with the ultra-slim

thickness of a spindle motor at all. Furthermore, in AIMIYA, the clamp 16 is provided only to fix the disk. AIMAYA does no disclose the clamp performing both sealing and fixing of a disk at the same time.

SAKURAGI reference is directed to the brushless motor of the outer rotor-type that fixes a rotor magnet on an inner circumference of a cylindrical recess formed in a hub having a magnetic disk, and reduces a electromagnetic noise and a PWM noise. SAKURAGI locates sealing components such as an upper magnetic fluid seal 11, and a lower magnetic fluid seal 18 over and under the bearings to prevent debris from entering into the bearings 7 and 8. Thus SAKURAGI is not concerned with the thickness of a spindle motor either. Furthermore, in SAKURAGI, the clamp 37 is provided only to fix the disk. SAKURAGI does not disclose the clamp performing both sealing and fixing of a disk at the same time.

TAKEMURA refers to and is concerned specifically with a spindle motor which can prevent a leakage of a lubricant included in the bearings 208 and 251 during rotation of the motor. TAKAMURA applies a ring-shaped sealing member 222, a ferro-fluid sealing device 216 and a cap 215 to the spindle motor. Furthermore, the sealing component is located under the bearing to prevent debris from entering into the bearings 208 and 251. Thus TAKEMURA is not concerned with the thickness of a spindle motor

nor disclose the ultra-slim spindle motor performing both sealing and fixing of a disk at the same time.

Therefore, the secondary references AIMIYA, SAKURAGI and TAKEMURA do not overcome the deficiencies of DUNFIELD. Thus, the asserted combination of DUNFIELD, AIMIYA, SAKURAGI and TAKEMURA would not result in the invention as recited in amended claim 1.

In the Office Action, claim 2 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., U.S. Patent No. 6,071,014 (hereinafter LEE) in view of DUNFIELD, AIMIYA, SAKURAGI and TAKEMURA. This rejection is also respectfully traversed.

Claim 2 has been amended to define the structural feature of the invention and to more clearly distinguish over the applied prior art references. In particular, the cited cylindrical hub and the cited fixed shaft are defined more clearly.

The spindle motor recited in amended claim 2 includes a base plate having a circular hole at a central portion of the base plate, a housing fixedly positioned in the circular hole of the base plate, a fixed cylindrical shaft formed unitarily with the housing at a central portion of the housing, extending inwardly into the housing and having a jaw portion at a central portion of an outer circumferential face of the housing, a stator bonded to an upper end portion of an inner circumferential face of the circular hole of the

base plate, and a thrust pad vertically inserted at the fixed shaft and mounted on the jaw portion of the fixed shaft.

The spindle motor further comprises a cylindrical hub with both ends open, the cylindrical hub having an outer protruding portion protruding from an upper side of an outer circumferential face of the hub and an inner protruding portion protruding from a lower side of an inner circumferential face of the hub, the cylindrical hub spaced by a certain interval from the thrust pad, a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub, a disk mounted on the outer protruding portion of the hub, and a clamp fixed to the hub by a bolt to mount the disk to the hub. The cylindrical hub is configured to provide a gap between the shaft and the clamp.

The references cited to support the rejection do not disclose such a combination of features. The primary reference LEE refers to and is concerned specifically with high speed performance of a spindle motor. The spindle motor of LEE includes a hub sleeve 162b and a stationary sleeve 166b located with an appropriate gap therebetween to smoothly perform a pumping action smoothly. In order to prevent a leakage of air or oil between a thrust plate 142b and a main hub 128b, a containment plate 154b is located on an upper portion of the spindle motor. In other words, to prevent a "leak out" from incurring in the bearing regions 128b and 142b, a sealing component such as a

containment plate 154b is located over the bearing, and thus LEE does not disclose the ultra-slim structure as recited in claim 2 of the present invention.

In contrast, in the present invention, the cylindrical hub 350 is open-ended on both upper and lower sides and the clamp 380 is fixed on the hub. Thus, the clamp 380 performs both sealing and fixing of a disk at the same time, thereby allows the present invention to provide an ultra-slim spindle motor which prevents an thickness increase caused by the sealing region.

Also, in the present invention, the stator 330 is bonded to an upper end portion of an inner circumferential face of the circular hole of the base plate 300, while, in LEE, the annular stator 176b is connected to the base member. Furthermore, in LEE, the spindle motor 120b includes a containment plate 154b to block the fluid, while, in the present invention, the clamp 280 serves as the containment plate 154b, thereby forming an ultra-slim disk spindle motor.

The secondary reference DUNFIELD refers to a spindle motor in which a problem resulting from an abrasion of a surface of a bearing portion caused by particles or debris produced by operating the spindle motor is solved. The spindle motor of DUNFIELD circulates a fluid 68 through a chamber 66 when it operates and locates a magnet 76 and a pocket 72 in a central portion of a counterplate 64 to collect particles or debris generated by an abrasion of the bearing portion. In further detail, to prevent leakage of a fluid and

an abrasion of the bearing portion resulting from particles or debris generated by a friction between a fluid and an inside of the bearing region, such as chamber 68 and hub 20, a counter plate 64, a magnet 66 and a pocket 72 are provided. The counterplate 64, the magnet 66 and the pocket 72 are employed to prevent abrasion of the bearing portion cause an increase in the thickness of the spindle motor. Thus DUNFIELD does not teach the ultra-slim spindle motor having the clamp performing both sealing and fixing a disk at the same time. AIMIYA, SAKURAGI and TAKEMURA references do not disclose such a combination of features, as described above with respect to claim 1.

Therefore, none of the secondary references DUNFIELD, AIMIYA, SAKURAGI and TAKEMURA overcome the deficiencies of LEE. Thus, the asserted combination of LEE, DUNFIELD, AIMIYA, SAKURAGI and TAKEMURA would not result in the invention as recited in amended claim 2.

Claim 2 has been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claim 2 has been amended to overcome the rejection by replacing "the housing" in line 5 with "the fixed shaft". This rejection is thus submitted to be moot.

Independent claims 1 and 2 are now in condition for allowance in view of the amendments and the above-noted remarks. Dependent claims 3-11 are also submitted to

be in condition for allowance in view of their dependence from an allowable base claim and also at least based upon their respective recitation of further features of the present invention. It is respectfully requested, therefore, that the rejections of claims 1 and 2 under 35 U.S.C. 103(a) and the rejection of claim 2 under 35 U.S.C. 112, second paragraph be withdrawn.

Based on the above, it is respectfully submitted that this application is now in condition for allowance, and a Notice of Allowance is respectfully requested.

Should the Examiner have any questions or comments regarding this response, or the present application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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P20978.A08

MARKED-UP COPY OF THE CLAIMS

1. (Three Times Amended) A disk-spindle motor having: a base plate having a circular hole at a central portion thereof; a housing fixedly [inserted into] positioned in the circular hole of the base plate; a fixed shaft formed unitarily with the housing at [an upper] a central portion of the housing and extending inwardly into the housing; a stator bonded to an upper end portion of an inner circumferential face of the circular hole; a lower ball bearing bonded to a lower side of an outer circumferential face of the fixed shaft, an upper ball bearing spaced by a certain interval from the lower ball bearing and bonded to an upper side of the outer circumferential face of the fixed shaft, and further comprising:

a cylindrical hub with both ends open, the cylindrical hub having an inner protruding portion protruding from a central portion of an inner circumferential face of the hub and an outer protruding portion protruding from an upper side of the outer circumferential face of the hub, the inner protruding portion being fixedly provided between the lower ball bearing and the upper ball bearing;

a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub;

a disk mounted on an upper face of the outer protruding portion of the hub; and

a clamp fixed to the upper side of the hub by a bolt to mount the disk to the hub,

wherein the cylindrical hub is configured to provide a gap between the shaft and the clamp.

2. (Three Times Amended) A disk-spindle motor having: a base plate having a circular hole at a central portion of the base plate; a housing fixedly [inserted into] positioned in the circular hole of the base plate; a fixed cylindrical shaft formed unitarily with the housing at [an upper] a central portion of the housing, extending inwardly into the housing and having a jaw portion at a central portion of an outer circumferential face of [the housing] the fixed shaft; a stator bonded to an upper end portion of an inner circumferential face of the circular hole of the base plate; a thrust pad vertically provided at the fixed shaft and mounted on the jaw portion of the fixed shaft, and further comprising:

a cylindrical hub with both ends open, the cylindrical hub having an outer protruding portion protruding from an upper side of an outer circumferential face of the hub and an inner protruding portion protruding from a lower side of an inner circumferential face of the hub, the cylindrical hub spaced by a certain interval from the thrust pad;

a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub;

a disk mounted on the outer protruding portion of the hub; and

a clamp fixed to the hub by a bolt to mount the disk to the hub,

wherein the cylindrical hub is configured to provide a gap between the shaft and the clamp.